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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09 872,798	06/02/2001	Hirofumi Harada	S004-4310	4143

7590 04/22/2002

ADAMS & WILKS
ATTORNEYS AND COUNSELORS AT LAW
31st FLOOR
50 BROADWAY
NEW YORK, NY 10004

EXAMINER

LE, THAO X

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 04/22/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/872,798

Applicant(s)

HARADA, HIROFUMI

Examiner

Thao X Le

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) 6-9 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☐ Claim(s) 1-5 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of claims 1-5 in Paper No. 5 is acknowledged. The traversal is on the ground(s) that the Examiner stated that the two inventions are patentably distinct from each other, thereby making restriction proper. This is not found persuasive because of the reasons in MPEP § 802.01 and the applicant has not provided a convincing argument that the materially different process would not be suitable in providing the recited device.

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claim 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6,274,905 to Mo, and further in view of the Applicant Admitted Prior Art (APA).

Regarding to claim 1, Mo teaches a vertical MOS transistor comprising: a semiconductor substrate 600 of a first conductive type, fig. 6A, a body region 604, column 4 line 12, of a second conductive type, fig. 6A, formed on substrate, a trench 602, column 4 line 11, formed through body region of a second conductive type, a gate insulating film 612, column 4 line 15, formed along a surface of body region of second conductive type and a wall surface and a bottom surface of trench, a polycrystalline

silicon gate 614, column 4 line 29, formed in trench so as to be in contact with gate insulating film, fig. 6B, and surrounded by gate insulating film, a metal silicide gate 626, column 5, fig. 6D lines 17, as a film formed in trench so as to be in contact with polycrystalline silicon gate and surrounded by gate insulating film and polycrystalline silicon gate, a source region 608, column 4 line 13, of first conductive type formed on surface of body region of second conductive type and around trench so as to be in contact with gate insulating film, fig. 6A, a gate electrode connected to polycrystalline silicon gate and metal silicide gate, column 5 lines 5-8, a source electrode 510 connected to source region, fig. 5 column 3 line 55.

But, Mo does not teach an epitaxial growth layer of first conductive type formed on semiconductor substrate, and a drain electrode connected to semiconductor substrate. However, the APA reference teaches, in fig. 2 and in the specification pages 1-4, an epitaxial growth layer 2 of first conductive type formed on semiconductor substrate, and a drain electrode connected to semiconductor substrate. At the time of the invention was made, it would have been obvious to one of ordinary skill in the art to combine the teaching of APA with Mo's reference, because forming of lightly doped layer of the first conductive type has the known purpose of reducing the electric field between the source and drain regions.

Regarding to claim 2, Mo teaches a vertical MOS transistor characterized in that film formed in trench so as to be in contact with polycrystalline silicon gate and surrounded by gate insulating film and polycrystalline silicon gate is a silicon compound, column 5, line 17.

Regarding to claim 3-4, Mo teaches a vertical MOS transistor characterized in that film formed in trench so as to be in contact with polycrystalline silicon gate and surrounded by gate insulating film and polycrystalline silicon gate is a silicon oxide film or silicon nitride, column 4, lines 15-18

Regarding to claim 5, Mo teaches a vertical MOS transistor characterized in that film formed in trench so as to be in contact with polycrystalline silicon gate and surrounded by gate insulating film and polycrystalline silicon gate is a metal film, column 4, lines 44-45.

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure US Patent 5,034,785 to Blanchard.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao X Le whose telephone number is 703-306-0208. The examiner can normally be reached on 8:00 - 4:30.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Application Control Number: 09-872,798
Art Unit: 2814

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Thao X. Le
April 18, 2002


PHAT X. CAO
PRIMARY EXAMINER